

In the claims

Claims 1-43 (Cancelled)

Claims 44-53 remain in the application.

1 **44.** (Original) A method of making a magnetic head assembly having a read head
2 and a write head comprising the steps of:
3 a forming of the write head comprising the steps of:
4 forming ferromagnetic first and second pole piece layers with a yoke portion
5 between a pole tip portion and a back gap portion;
6 forming a nonmagnetic write gap layer between the pole tip portions of the first
7 and second pole piece layers;
8 forming an insulation stack with at least one coil layer embedded therein in the
9 yoke portions of the first and second pole piece layers; and
10 connecting the first and second pole piece layers at their back gaps portions;
11 a forming of the read head comprising the steps of:
12 forming nonmagnetic nonconductive first and second read gap layers;
13 forming a dual spin valve sensor between the first and second read gap layers;
14 forming a ferromagnetic first shield layer; and
15 forming the first and second read gap layers between the first shield layer and the
16 first pole piece layer;
17 a making of the dual spin valve sensor comprising the steps of:
18 forming first and second pinned layer structures wherein each pinned layer
19 structure has a magnetic moment;
20 forming antiferromagnetic first and second pinning layers exchange coupled to
21 the first and second pinned layer structures for pinning the magnetic moment of the first
22 and second pinned layers respectively;
23 forming an antiparallel (AP) coupled free layer structure between the first and
24 second pinned layer structures with a magnetic moment; and
25 forming a nonmagnetic conductive first spacer layer between the first pinned
26 layer structure and the AP coupled free layer structure and a nonmagnetic conductive
27 second spacer layer between the second pinned layer structure and the AP coupled free
28 layer structure; and
29 a making of the AP coupled free layer structure including the steps of:

30 forming ferromagnetic first, second and third antiparallel (AP) coupled
31 free layers; and

32 forming a first antiparallel (AP) coupling layer between the first and second AP
33 coupled free layers and a second antiparallel (AP) coupling layer between the second and
34 third AP free layers.

1 45. (Original) A method as claimed in claim 44 further comprising the steps of:
2 forming a ferromagnetic second shield layer between the second read gap layer and the
3 first pole piece layer; and
4 forming a nonmagnetic separation layer between the second shield layer the first pole
5 piece layer.

1 46. (Original) A method as claimed in claim 44 as claimed in claim wherein the
2 first and third AP coupled free layers are formed of a cobalt based material and the second AP
3 coupled free layer is formed of a nickel iron based material.

1 47. (Original) A method as claimed in claim 46 wherein the second AP coupled
2 free layer is formed with a magnetic thickness that is greater than a net magnetic thickness of the
3 first and third AP coupled free layers.

1 48. (Original) A method as claimed in claim 47 wherein the magnetic thicknesses
2 of the first and third AP coupled free layers are equal.

1 49. (Original) A method as claimed in claim 48 wherein the materials of the first
2 and second pinning layers are the same.

1 50. (Original) A method as claimed in claim 49 wherein the first pinned layer
2 structure is a double antiparallel (AP) pinned layer structure that is formed comprising the steps
3 of:
4 forming ferromagnetic first and second antiparallel (AP) coupled pinned layers; and
5 forming an antiparallel (AP) coupling layer between and interfacing the first and second
6 AP pinned layers.

1 **51.** (Original) A method as claimed in claim 50 wherein the second pinned layer
2 is a triple antiparallel (AP) pinned layer structure that is made comprising the steps of:
3 forming ferromagnetic first, second and third antiparallel (AP) coupled pinned layers; and
4 forming a nonmagnetic first antiparallel (AP) coupling layer between and interfacing the
5 first and second AP pinned layers and forming a nonmagnetic second antiparallel (AP) coupling
6 layer between and interfacing the second and third AP pinned layers.

1 **52.** (Original) A method as claimed in claim 51 wherein the double AP pinned
2 layer structure is formed with a net magnetic moment that is equal to a net magnetic moment of
3 the triple AP pinned layer structure.

1 **53.** (Original) A method as claimed in claim 52 wherein:
2 each of the double and the triple AP pinned layer structures is formed with a
3 ferromagnetic coupling field with respect to the free layer structure; and
4 the ferromagnetic coupling fields of the double and the triple AP pinned layer structures
5 are equal.